

10672711\_CLS1.txt  
Most Frequently Occurring Classifications of Patents Returned  
From A Search of 10672711 on June 14, 2005

Original Classifications

2 257/301  
2 433/223

Cross-Reference Classifications

3 365/185.17  
3 365/201  
3 ~~714/721~~  
2 257/332  
2 257/E27.084  
2 257/E27.092  
2 257/E27.112  
2 365/170  
2 365/185.12  
2 365/185.22  
2 711/112  
2 711/117

Combined Classifications

4 365/185.17  
3 365/185.22  
3 365/201  
3 714/721  
2 257/301  
2 257/332  
2 257/E27.084  
2 257/E27.092  
2 257/E27.112  
2 365/151  
2 365/158  
2 365/170  
2 365/185.12  
2 365/200  
2 433/223  
2 711/112  
2 711/117  
2 711/162  
2 712/22

714/748, 18  
370/428, 420, 229, 329  
711/114, 111, 187



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Appendix 6

 BPS form
  353R form
  Image
  Text
  HTML

✓ Hits ○ Details **HTPR**



US006587935B2

# (12) United States Patent Ofek

(10) Patent No.: US 6,587,935 B2  
(45) Date of Patent: Jul. 1, 2003

## (54) METHOD AND APPARATUS FOR MIRRORING DATA IN A REMOTE DATA STORAGE SYSTEM

(75) Inventor: Yuval Ofek, Framingham, MA (US)

(73) Assignee: EMC Corporation, Hopkinton, MA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 10/229,233

(22) Filed: Aug. 27, 2002

## (65) Prior Publication Data

US 2002/0199036 A1 Dec. 26, 2002

## Related U.S. Application Data

(53) Continuation of application No. 09/257,734, filed on Mar. 13, 1999, now Pat. No. 6,477,677, which is a continuation-in-part of application No. 06/637,760, filed on May 31, 1995, now Pat. No. 5,933,553.

(51) Int. Cl.: G06E 12/00

(52) U.S. Cl.: 711/162

(58) Field of Search: 711/162, 151, 711/114; 709/234; 370/232

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Primary Examiner—Do Hyun Yoo

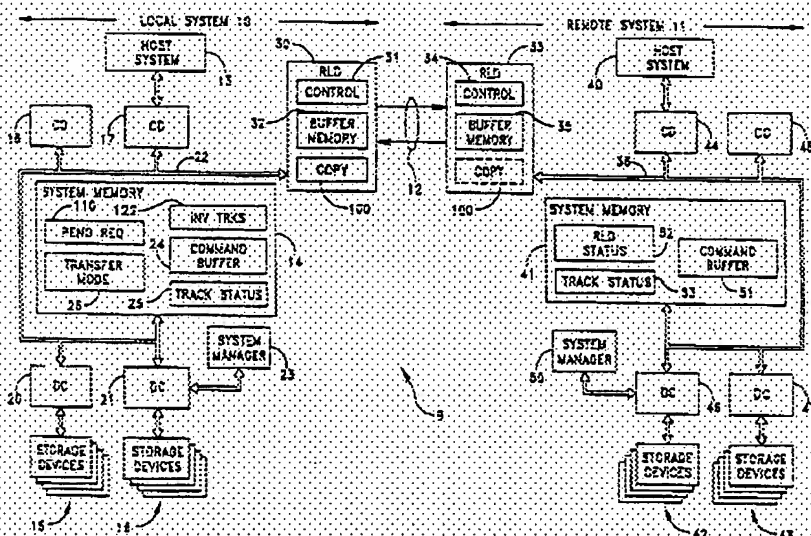
Assistant Examiner—Brian R. Peugh

(74) Attorney, Agent, or Firm—George A. Herbert

## (57) ABSTRACT

A data processing network including a local system and a geographically remote system. Each of the local and remote systems includes a data storage facility. The remote data storage facility mirrors the local data storage facility. In a normal operating mode, the local and remote systems operate in near synchronism or in synchronism. In an alternate operating mode, writing operations at the local system immediately update the storage devices in the local data storage facility. Transfers of corresponding data to the remote data storage facility are made independently of and asynchronously with respect to the operation of the local system.

21 Claims, 11 Drawing Sheets



US-PAT-NO 6587935

DOCUMENT IDENTIFIER: US 6587935 B2

TITLE: Method and apparatus for mirroring data in a remote data storage system

KWIC

US Patent No. - PN (1): 6587935

## Detailed Description Text DETX (15)

As will become apparent later, the alternate operating mode can be implemented with either of two procedures and that the alternate operating mode can be controlled so it operates only under certain conditions or constraints.

The first is an "ADAPTIVE COPY-WRITE PENDING" procedure. Step 66 determines whether this procedure was being processed and interrupted to return to the SYNC operating mode. If it was, step 67 determines whether the number of write requests pending for the remote system are above a maximum. If they are not, system operation advances to FIG. 2D and returns to the ADAPTIVE COPY-WRITE PENDING operating mode. Otherwise the system transfers to await an acknowledgement signal in step 70. The other alternating operating mode is an "ADAPTIVE COPY-DISK" operating mode. Step 71 determines whether the requested SYNC operation has been initiated by interrupting such an ADAPTIVE COPY-DISK operating mode. If it has, the system tests the number of invalid tracks listed in the TRACK STATUS table 28 of FIG. 1. If the number of marked tracks are above a maximum, step 72 transfers to step 70. Otherwise control transfers to the steps in FIG. 2E and returns the operations to the ADAPTIVE COPY-DISK operating mode.

Otherwise the system transfers to await an acknowledgement signal in step 70. The other alternating operating mode is an "ADAPTIVE COPY-DISK" operating mode. Step 71 determines whether the requested SYNC operation has been initiated by interrupting such an ADAPTIVE COPY-DISK operating mode. If it has, the system tests the number of invalid tracks listed in the TRACK STATUS table 28 of FIG. 1. If the number of marked tracks are above a maximum, step 72 transfers to step 70. Otherwise control transfers to the steps in FIG. 2E and returns the operations to the ADAPTIVE COPY-DISK operating mode.

Otherwise the system transfers to await an acknowledgement signal in step 70. The other alternating operating mode is an "ADAPTIVE COPY-DISK" operating mode. Step 71 determines whether the requested SYNC operation has been initiated by interrupting such an ADAPTIVE COPY-DISK operating mode. If it has, the system tests the number of invalid tracks listed in the TRACK STATUS table 28 of FIG. 1. If the number of marked tracks are above a maximum, step 72 transfers to step 70. Otherwise control transfers to the steps in FIG. 2E and returns the operations to the ADAPTIVE COPY-DISK operating mode.

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## Detailed Description Text DETX (30)

As will be apparent, in this mode data transfers from the local system 10 to the remote system 11 but the local system 10 does not wait for the receipt of any acknowledgment or synchronization from the remote system 11. This mode is especially useful when a large amount of data must be transferred to remote

Details and performance are provided in the following figures.

Details Text Image HTML Full

	U	1	Document	Issue Dat	Pa	Current	Current XR	Title
20	<input type="checkbox"/>	<input checked="" type="checkbox"/>	US 5379379	1995010	24	711/3	711/158	Memory control unit with self
21	<input type="checkbox"/>	<input type="checkbox"/>	US 5341483	1994082	85	711/206		Dynamic hierarchical associa
22	<input type="checkbox"/>	<input type="checkbox"/>	US 6363466	2002032	12	711/169	710/112	Interface and process for h
23	<input type="checkbox"/>	<input type="checkbox"/>	US 6738881	2004051	25	711/168	370/329	Multi-channel DMA with sche
24	<input type="checkbox"/>	<input type="checkbox"/>	US 6725347	2004042	18	711/167	710/52	Spin-wheel SDRAM access
25	<input type="checkbox"/>	<input type="checkbox"/>	US 2003020	2003103	12	711/164	711/154	Methods and apparatus for
26	<input type="checkbox"/>	<input type="checkbox"/>	US 2002015	2002101	30	711/162	711/114	Unified data sets distributed
27	<input type="checkbox"/>	<input type="checkbox"/>	US 6662282	2003120	30	711/162	711/111	Unified data sets distributed
28	<input type="checkbox"/>	<input type="checkbox"/>	US 6587935	2003070	20	711/162		Method and apparatus for n
29	<input type="checkbox"/>	<input type="checkbox"/>	US 6477627	2002110	20	711/162	709/234	Method and apparatus for